

TC-6110 Series

EN 50155-compliant x86 train computer with dual LAN ports, dual power inputs, USB, VGA, serial port, CompactFlash, and 4 expansion slots



- > Durable, fanless design for rolling stock applications
- > Modular design for easy storage and peripheral expansion
- > Comes with Moxa SafeGuard™, for HDD and data security in wide temperature and high vibration environments
- > Compact rackmount 3U housing, wide 24 to 110 VDC isolated power supply
- > Supports SNMP-based system configuration, control, and monitoring
- > Complies with the essential sections of EN 50155 regarding vibration and temperature
- > Conformal coating models available



Introduction

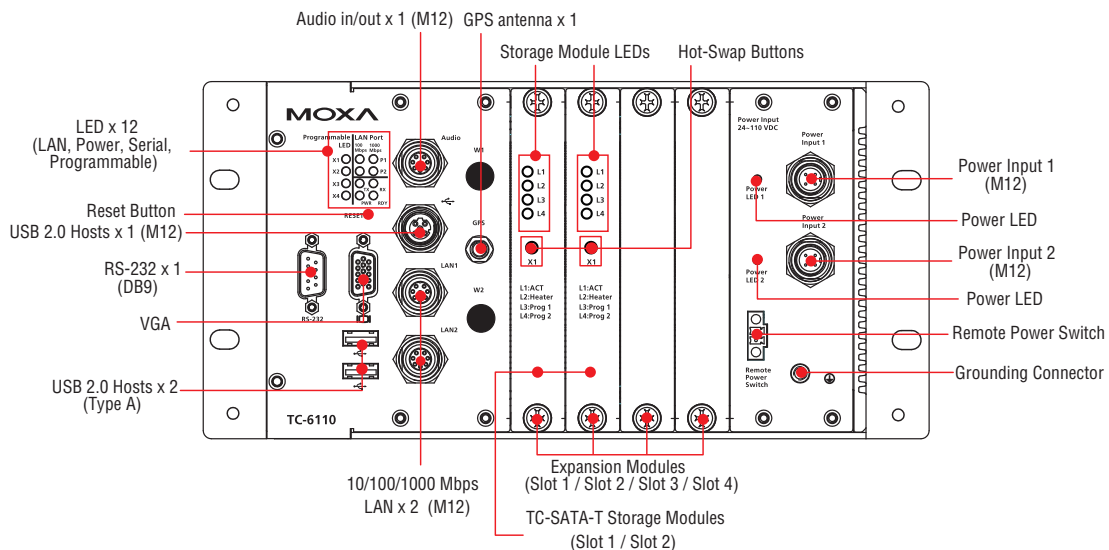
TC-6110 train computers are designed specifically for car-borne train automation like network video recorders, passenger information systems, condition monitoring, and train-to-ground communications. The computers come with two Gigabit LAN ports, one RS-232 serial port, three USB 2.0 ports, and two TC-SATA-T storage modules, giving customers a versatile solution for on-board train computing.

Designed for high reliability in the demanding conditions experienced in on-board train environments, TC-6110 computers come with M12 connectors on both the Gigabit LAN ports and dual power inputs, and

an additional M12 USB port. The TC-6000 Series expansion modules further allow for highly flexible, convenient integration into a variety of systems. Users can easily add storage modules for additional capacity, Gigabit switch modules to expand network connectivity and/or bandwidth, serial and CAN bus modules for additional serial/CAN device connectivity, or mini PCIe modules for additional peripheral communications.

For the strongest component protection in harsh environments, TC-6110 Series computers are available with conformal coating.

Appearance



Hardware Specifications

Computer

CPU: Intel Atom D525, dual core 64 bit threaded 1.8 GHz, 1 MB for L2 cache

OS (pre-installed): Windows Embedded Standard 7

System Chipset: ICH8-M

System Memory: 4 GB capacity, 2 GB pre-installed: 2 slots of 2 GB DDR3-1066 204 pin SO-DIMM SDRAM

USB: 3 USB 2.0 compliant hosts; 2 with type A connectors supporting system bootup, 1 with M12 connector

Storage

Built-in: 8 GB onboard industrial CompactFlash card for operating system storage

HDD Support: 2 removable TC-SATA-T storage trays, for 2.5" SSD or HDD storage drive (with Intelligent Heating Solution)

Other Peripherals

Audio: 1 line in / line out interface with M12 connector

Independent Sensors: Accelerometer (G-sensor), thermometer (T-sensor)

Display

Graphics Controller: Integrated Intel GMA 3150 (Pineview) Graphics Engine

VGA Interface: Up to 2048 x 1536 resolution at 75 Hz, Female DB15 connector

Ethernet Interface

LAN: 2 auto-sensing 10/100/1000 Mbps ports (M12)

GPS Module

Receiver Types: 50 channels, GPS L1 C/A code, SBAS (WAAS), EGNOS, MSAS, GAGAN

Acquisition:

- Cold start: 29 s
- Warm start: 29 s
- Aided start: 1 s
- Hot start: 1 s

Sensitivity:

- Tracking & Navigation: -160 dBm
- Reacquisition: -160 dBm
- Cold start: -147 dBm

Accuracy:

- Autonomous: 2.5 m
- SBAS: 2.0 m

Protocols: NMEA, UBX binary, max. update rate: 5 Hz (ROM version)

Time Pulse: 0.25 Hz to 1 kHz

Velocity Accuracy: 0.1 m/s

Heading Accuracy: 0.5°

A-GPS: AssistNow Online/Offline, SUPL (Open Mobile Alliance) compliant

Operational Limits:

- Dynamics ≤ 4 g
- Altitude 50,000 m
- Velocity 500 m/s

Connector Type: QMA

WLAN Module (Available on request)

Standards: IEEE 802.11 a/b/g/n for wireless LAN

Security: WEP, TKIP, and AES hardware encryption

Antenna Type: 2 QMA connectors (female type)

Mode: Client (default), Access Point (available on request)

Serial Interface

Serial Standards: 1 RS-232 port (DB9 male)

Data Bits: 5, 6, 7, 8

Stop Bits: 1, 1.5, 2

Parity: None, Even, Odd, Space, Mark

Flow Control: RTS/CTS

Baudrate: Up to 115.2 kbps

Serial Signals

RS-232: Tx/D, Rx/D, DTR, DSR, RTS, CTS, DCD, GND

LEDs

System: Independent "Power" and "System Ready" signals

LAN: 100M/Link x 2, 1000M/Link x 2

Serial: TX x 1, RX x 1

Other: Programmable x 4

Physical Characteristics

Housing: Aluminum and SECC sheet metal (1 mm)

Weight: 5 kg

Dimensions:

- Without ears: 210 x 222 x 133 mm (8.27 x 8.74 x 5.24 in)
- With ears: 210 x 269 x 133 mm (8.27 x 10.60 x 5.24 in)

Mounting: Rack

Environmental Limits

Operating Temperature:

- Standard models: -25 to 55°C (-13 to 140°F), (EN 50155 Class T1)
- Wide temp. models: -40 to 70°C (-40 to 158°F), (EN 50155 Class Tx)

Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Anti-vibration: Meets EN 50155 standard

Anti-shock: Meets EN 50155 standard

Power

Reset Button: For warm reboot (front panel)

Input Voltage: 24 to 110 VDC, M12 connector

Power Consumption: 32 W (without heater), 62 W (with heater), no SSD/HDD attached

Note: 24 VDC and 110 VDC compliant with EN 50155

Standards and Certifications

Safety: UL 60950-1, CSA C22.2 No. 60950-1-07, EN 60950-1

EMC: EN 55022:2010 Class A, EN 55024:2010, FCC CFR Title 47 Part 15 Subpart B: 2011 Class A, CISPR 22:2008, ANSI C63.4:2009, ICES-003 Issue 5:2012 Class A

RF: EN 62311:Jan 2008, ETSI EN 301 489-1:V1.9.2 (2011-09), ETSI EN 301 489-3:V1.4.1 (2002-08), ETSI EN 301 893:V1.6.1 (2011-11), ETSI EN 300 328:V1.7.1 (2006-10), ETSI EN 300 440-1:V1.6.1 (2010-08), ETSI EN 300 440-2:V1.4.1 (2010-08)

Rail Traffic: EN 50155:2007, EN 50121-1:2006 for EMC test, EN 50121-3-2:2006, EN 50121-4:2006, EN 5011:2009+A1:2010, EN 61000-6-4:2007, CISPR 16-1-2:2003/A2:2006, CISPR 16-2-1:2003+A1:2005, CISPR 16-2-3:2006, EN 60068-2-1:2007, EN 60068-2-2:2007, EN 61373:1999

Environmental Tests: EN 60068-2-1:2007, EN 60068-2-2:2007, EN 61373:1999

Reliability

Automatic Reboot Trigger: Built-in WDT (watchdog timer) supporting system reset with software programmable time intervals of 1-255

Warranty

Warranty Period: 3 years

Details: See www.moxa.com/warranty

Note: These hardware specifications describe the embedded computer unit itself, but not its official accessories. In particular, the wide temperature specification does not apply to accessories such as power adaptors and cables.

: TC-SATA-T Storage Module

SATA Interface

Description: 2.5" SATA, hot swappable, with anti-vibration, G-sensor, temperature sensor

LEDs: ACT x 1, Heater x 1, Prog 1 x 1, Prog 2 x 1

Physical Characteristics

Weight: 200 g

Dimensions: 186 x 118 x 20 mm (7.32 x 4.65 x 0.79 in)

Environmental Limits

Operating Temperature: Wide Temp. Models: -40 to 70°C (-40 to 158°F) (EN 50155 Class TX)

Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Note: The TC-SATA-T storage module can be inserted into slot 1, slot 2, or slot 3. However, slot 3 does not feature the intelligent heating solution.

: TC-PoE04-M12 Switch Module (Pending)

Ethernet Interface

Switch Ports: 4 auto-sensing 10/100/1000 Mbps PoE ports (M12), hot swappable

Standards: IEEE 802.3af/at for Power-over-Ethernet

PSE: Power Source Equipment

Power Consumption: 15.4 W per port (up to 4 ports, needs 150 W power module)

Protection: 1.5 kV magnetic isolation protection

LEDs: 100M Link x 1 Act/Link; 1000M Act/Link x 1

Physical Characteristics

Weight: 220 g

Dimensions: 186 x 118 x 20 mm (7.32 x 4.65 x 0.79 in)

Environmental Limits

Operating Temperature:

• Standard models: -25 to 55°C (-13 to 131°F) (EN 50155 Class T1)

• Wide temp. models: -40 to 70°C (-40 to 158°F) (EN 50155 Class TX)

Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Note: TC-PoE04-M12 switch modules can be inserted into slot 3 or slot 4.

: TC-DK10-T/TC-DK20-T mini PCIe Module (Pending)

Mini PCIe Card

Interface:

- Socket 1: PCIe V1.0 (one lane) / USB 2.0
- Socket 2: USB 2.0 (TC-DK10-T), PCIe V1.0 (one lane) / USB 2.0 (TC-DK20-T)
- Socket 3: USB 2.0 (TC-DK10-T), PCIe V1.0 (one lane) / USB 2.0 (TC-DK20-T)
- Socket 4: USB 2.0 (TC-DK10-T), PCIe V1.0 (one lane) / USB 2.0 (TC-DK20-T)

USB 2.0 Bus SIM Card Slot: Reserved for cellular applications

Physical Characteristics

Dimensions: 186 x 118 x 20 mm (7.32 x 4.65 x 0.79 in)

Weight: 125 g

Environmental Limits

Operating Temperature: -40 to 70°C (-40 to 158°F) (EN 50155 Class TX)

Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Note: The TC-DK10-T/TC-DK20-T mini PCIe Module can be inserted into slot 1, slot 2, slot 3, or slot 4. However, when mounted in slot 1 or slot 2 the TC-DK10-T/TC-DK20-T can only communicate with the USB interface, whereas when mounted in slot 3 or slot 4 it may communicate with either the USB or PCIe interface.

Model	TC-DK10-T				TC-DK20-T			
Interface	Socket 1	Socket 2	Socket 3	Socket 4	Socket 1	Socket 2	Socket 3	Socket 4
PCIe V1.0 (one lane)	✓	–	–	–	✓	✓	✓	✓
USB .20	✓	✓	✓	✓	✓	✓	✓	✓

: TC-SP04-DB44-T Serial Module (Pending)

Serial Port Interface

Serial Standards:

4 RS-232/422/485 ports, software-selectable (DB44 female)

Serial Communication Parameters

Data Bits: 5, 6, 7, 8

Stop Bits: 1, 1.5, 2

Parity: None, Even, Odd, Space, Mark

Flow Control: RTS/CTS, XON/XOFF, ADDC® (automatic data direction control) for RS-485

Baudrate: 50 bps to 921.6 Kbps (non-standard baudrates supported; see user's manual for details)

Physical Characteristics

Dimensions: 186 x 118 x 20 mm (7.32 x 4.65 x 0.79 in)

Weight: 180 g

Environmental Limits

Operating Temperature: -40 to 70°C (-40 to 158°F) (EN 50155 Class TX)

Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Note: The TC-SP04-DB44-T Serial Module can be inserted into slot 3 or slot 4.

: TC-CP02-DB-T CAN Module (Pending)

CAN Interface

Interface:

2 optically isolated CAN2.0A/2.0B compliant port

Signal: CAN-H, CAN-L

Isolation:

2 kV

Speed: 1 Mbps

Connector Type: DB9 male

Physical Characteristics

Dimensions: 186 x 118 x 20 mm (7.32 x 4.65 x 0.79 in)

Weight: 180 g

Environmental Limits

Operating Temperature: -40 to 70°C (-40 to 158°F) (EN 50155 Class TX)

Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Note: The TC-CP02-DB-T CAN Module can be inserted into slot 3 or slot 4.

: TC-SW04-M12-T Switch Module (Pending)

Ethernet Interface

Standard:

4 auto-sensing 10/100/1000 Mbps Gigabit Ethernet switch ports

Protection: 1.5 kV magnetic isolation protection

Connector Type: 8-pin M12 A-coded

Physical Characteristics

Dimensions: 186 x 118 x 20 mm (7.32 x 4.65 x 0.79 in)

Weight: 180 g

Environmental Limits

Operating Temperature: -40 to 70°C (-40 to 158°F) (EN 50155 Class TX)

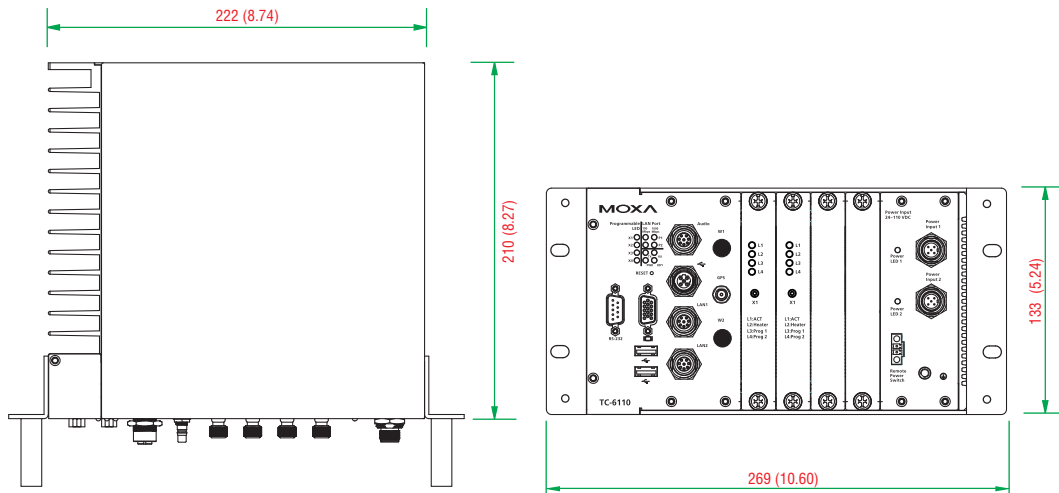
Storage Temperature: -40 to 85°C (-40 to 185°F)

Ambient Relative Humidity: 5 to 95% (non-condensing)

Note: The TC-SW04-M12-T Switch Module can be inserted into slot 3 or slot 4.

Dimensions

Unit: mm (inch)



• Software Specifications

Linux

OS: Linux Debian 7

File System: EXT 4

Internet Protocol Suite: TCP, UDP, IPv4, SNMPv1/v2c/v3, ICMP, ARP, HTTP, SSH 1.0/2.0, SSL, DHCP, NTP, NFS, Telnet, FTP, TFTP, PPP, PPPoE

Internet Security: OpenVPN, iptables firewall

Web Server (Apache): Allows you to create and manage websites; supports PHP and XML

Secure Shell for Remote Access: SSH allows remote logins to a secure encrypted console from any connected network Dial-up Networking: PPP Daemon for Linux that allows Unix machines to connect to the Internet through dialup lines, using the Point-to-Point Protocol (PPP). Works with 'chat', 'dip', and 'dialup'dip', and 'diald',

among (many) others. Supports IP, TCP, UDP, and (for Linux) IPX (Novell).

File Server: Enables remote clients to access files and other resources over the network

Watchdog: A watchdog timer that triggers a system reset upon software freezes, for both specific applications and system-wide failures.

Application Development Software:

- Moxa API Library
- GNU C/C++ cross-compiler
- GNU C library
- Perl

Software Package:

- SNMP
- SafeGaurd technology

Windows Embedded Standard 7

Core OS:

- Windows 7 Embedded, 32 bit
- Sensor and Location Platform
- Remote Procedure Call

Applications and Services Development:

- .Net Framework 4.0
- Remote Desktop Protocol 7.1
- COM OLE Application Support
- COM+ Application Support
- MSMQ

Internet Services: • Internet Explorer 8.0

• IIS 7.0

Diagnostics: • Common Diagnostic Tools

• Problem Reports and Solutions

Fonts:

• Chinese (Trad. and Simp.), Middle East, South East Asian, and South Asian Fonts

• True Type Fonts

Graphics and Multimedia:

- MPEG DTV-DVD Audio Decoder (MPEG-2, AAC)
- MPEG Layer-3 Audio Codecs(MP3)
- MPEG4 Decoders
- Windows Media Video VC-1 (WMV) Codecs
- DirectX and Windows Device Experience
- Windows Media Player 12

International: • IME Simplified Chinese Support

• IME Traditional Chinese Support

Management: • Group Policy Management

• Windows Management Instrument (WMI)

• Windows Update

Networking: • Extensible Authentication Protocol (EAP)

• Internet Authentication Service

• Telnet Server

- Bluetooth
- Domain Services
- Network Access Protection
- Network and Sharing Center
- Quality of Service
- Remote Access Service (RAS)
- Telephony API Client
- Windows Firewall
- Wireless Networking

Security: • Credential Roaming Service

• Credentials and Certificate Management

• Windows Authorization Manager (AZMAN)

• Windows Security Center

• Active Directory Rights Management

• Security Base

• Encrypted File System (EFS)

Embedded Features:

- Enhanced Write Filter(EWF)
- File-Based Write Filter (FBWF)
- Message Box Default Reply
- Registry Filter
- WSDAPI for .NET

File Systems and Data Storage:

- Windows Data Access Components
- Windows Backup and Restore

Embedded Self-Health Diagnostics: SNMP-based remote scripting layer for monitoring, reporting, and control

: Ordering Information

Available Models

TC-6110-W7E: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, WLAN module (available on request), Win7 Embedded (32-bit), -25 to 55°C operating temperature range, compliant with EN 50155 Class T1

TC-6110-T-W7E: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, WLAN module (available on request), Win7 Embedded (32-bit), -40 to 70°C operating temperature range, compliant with EN 50155 Class TX

TC-6110-CT-W7E: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, conformal coating, WLAN module (available on request), Win7 Embedded (32-bit), -25 to 55°C operating temperature range, compliant with EN 50155 Class T1

TC-6110-CT-T-W7E: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, conformal coating, WLAN module (available on request), Win7 Embedded (32-bit), -40 to 70°C operating temperature range, compliant with EN 50155 Class TX

TC-6110-LX: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, WLAN module (available on request), Linux Debian 7, -25 to 55°C operating temperature range, compliant with EN 50155 Class T1

TC-6110-T-LX: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, WLAN module (available on request), Linux Debian 7, -40 to 70°C operating temperature range, compliant with EN 50155 Class TX

TC-6110-CT-LX: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, conformal coating, WLAN module (available on request), Linux Debian 7, -25 to 55°C operating temperature range, compliant with EN 50155 Class T1

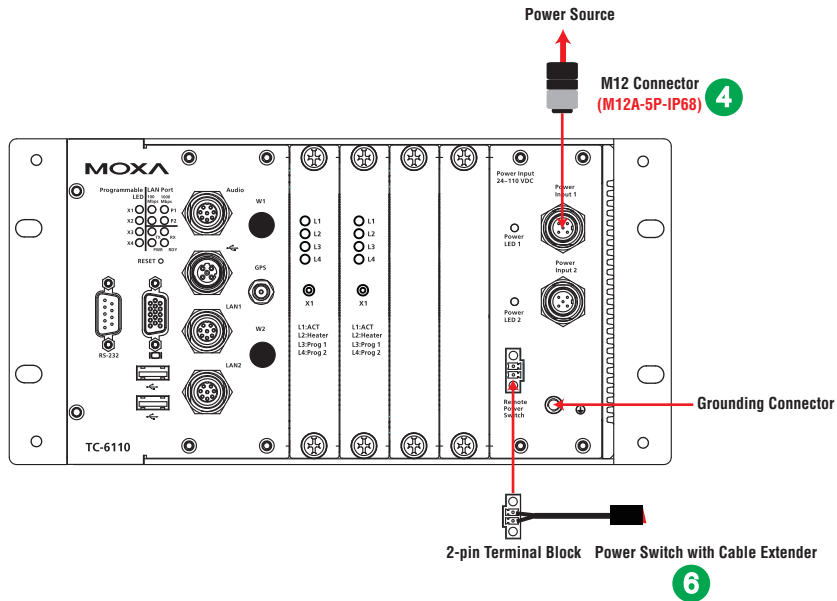
TC-6110-CT-T-LX: Modular 3U/42HP train computer, Intel Atom D525 1.8 GHz CPU, 4 expansion slots, 24 to 110 VDC isolated power, conformal coating, WLAN module (available on request), Linux Debian 7, -40 to 70°C operating temperature range, compliant with EN 50155 Class TX

Package Checklist

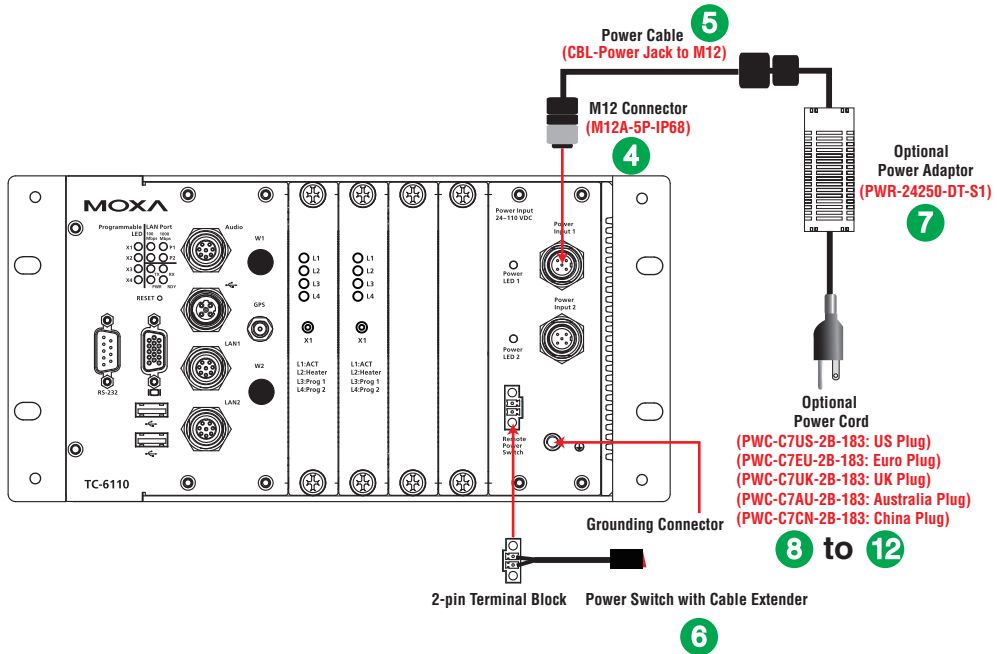
- TC-6110 train computer
- Rackmount kit
- Power switch with cable extender
- M12 connector (M12A-5P-IP68)
- Power cable (CBL-Power Jack to M12)
- Quick installation guide (printed)
- Documentation and software CD or DVD
- Warranty card

Accessory Installation and Layout

Field Site Installation



Office Testing and System Development



Optional Accessories

Ethernet	NO.	Type	Model Name	Description
	1	Cable & Connector	CBL-M12MM8PRJ45-BK-100-IP67	1 meter A-coded M12-to-RJ45 Cat-5E UTP Gigabit Ethernet cable, 8-pin male M12 connector, rated IP67
	2	Connector	M12A-8PMM-IP67	Field-installation A-coded Gigabit Ethernet connector, 8-pin threaded male M12 connector, rated IP68
Power				
	3	Cable & Connector	CBL-M12(FF5P)/OPEN-100 IP67	1 meter A-coded M12-to-5-pin power cable, 5-pin female M12 connector, rated IP67
	4	M12 Connector	M12A-5P-IP68	Field-installation A-coded power connector, 5-pin threaded female M12 connector, rated IP68
	5	Power Cable	CBL-Power Jack to M12	Power jack to M12 cable
	6	Power Switch with Cable Extender	CBL-ROSWJPW-10	Power switch with cable extender
	7	Adaptor	PWR-24250-DT-S1	Power adaptor with input: 100 - 240 VAC, 50-60 Hz, 1.5 A, output: 24 VDC, 2.5 A, 60 W, for test and system development in the office under ambient temperature
	8	Power Cord	PWC-C7US-2B-183	Power cord with 2-pin connector, USA plug
	9	Power Cord	PWC-C7EU-2B-183	Power cord with 2-pin connector, Euro plug
	10	Power Cord	PWC-C7UK-2B-183	Power cord with 2-pin connector, British plug
	11	Power Cord	PWC-C7AU-2B-183	Power cord with 2-pin connector, Australia plug
	12	Power Cord	PWC-C7CN-2B-183	Power cord with 2-pin connector, China plug
Audio				
	13	Connector	M12A-8PMM-IP67	Field-installation A-coded 8-pin threaded male M12 connector, rated IP68
USB				
	14	Connector	M12A-5PMM-IP68	D-coded threaded USB connector, 5-pin male M12 connector, rated IP68
GPS				
	15	Cable	A-CRF-QMAMSF-R2-50	QMA (male) to SMA (female) adaptor with 50cm cable
	16	Antenna	ANT-GPS-OSM-05-3M	26 dBi, 1572 MHz, L1 band SMA antenna
Mechanical				
	17	Rack Panel Extender	9.5 to 19-inch Rack Panel Extender	TC-6110 Series Rack Panel Extender